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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/761,753 | 01/18/2001 | Yukimasa Ishida | 980307A | 8695 |

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EXAMINER

TOLEDO, FERNANDO L

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| ART UNIT | PAPER NUMBER |
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2823

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/761,753

Applicant(s)

ISHIDA ET AL.

Examiner

Fernando Toledo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8,9 and 22-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8,9 and 22-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1 – 6, 8 and 9 are is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.
3. Claim 1 recites the following limitation: the side surfaces of the bus lines and the side surface of the conduction portion are outwardly convex. Convex as defined by the Webster's Collegiate Dictionary 10th Edition is "curved or rounded like the exterior of a sphere or circle." There is no support for the bus line being convex, it is instead tapered or has inclined sides. Also the conduction portion only has support for a part of it being convex while the claim can be interpret that the whole bus line and conduction portion are convex.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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5. Claims 22 – 25 and 27 – 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (U. S. patent 6,228,991 B1) in view of Noumi et al. (U. S. patent 5,915,172 A) Applicant's Admitted Prior Art (AAPA) and Ghandhi, Sorab (VLSI Fabrication Principles Silicon and Gallium Arsenide).

In re claims 22 and 24, Zhang in the U. S. patent 6,338,991 B1; figures 1A – 11D discloses, forming a conducting layer composed of an anodically oxidizable metal on a substrate (figure 4A); etching the conducting line to a predetermined shape (column 13); forming an oxide film on the conducting layer.

Zhang does not disclose forming a first oxide layer with a thickness and removing the first oxide layer by washing the substrate.

However according to AAPA, a native oxide is spontaneously formed on a conducting layer by leaving the conducting layer alone (page 26, lines 28 – 30).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form a first oxide layer in the invention of Zhang since according to AAPA a native oxide will form on a conducting film spontaneously.

Zhang in view of AAPA does not disclose removing the first oxide by washing the substrate.

However, Ghandhi in the textbook, VLSI Fabrication Principles Silicon and Gallium Arsenide page 641 discloses that the wafers must be cleaned after each processing step in order to avoid operator error.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to wash the device of Zhang in view of AAPA and hence the first

oxide layer would be removed, since, according to Ghandhi washing after every single processing step will avoid operator error.

6. In re claim 23, Zhang teaches wherein the anodically oxidizable metal includes at least ^{one} of Al, Ta, Al-Si, Al-Ta, Al-Zr, Al-Nd, Al-Pd, Al-W, Al-Ti, Al-Ti-B, Al-Sc, Al-Y, Al-Pt and Al-Pa (column 13).

7. In re claim 25, Zhang in view of AAPA and Ghandhi does not disclose wherein the thickness of the first oxide is between 50 – 100 nm.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the thickness of the first oxide to be between 50 – 100 nm, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

8. In re claim 27, Zhang teaches wherein the thin-film device is a substrate including thin-film transistor (figure 4C).

9. In re claim 28, Zhang teaches further including forming an insulating film on the substrate 1b and forming a semiconductor layer 27a,b,c on the substrate after the

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second oxide film has been formed, wherein the etching of the conducting layer forms gate electrodes and gate wirings (Figure 4C).

10. In re claim 29, Zhang discloses further including forming a semiconductor layer 11a and forming an insulating film 12 on the substrate prior to forming the conducting layer wherein the etching of the conducting layer forms gate electrodes and gate wirings (Figure 4C).

11. In re claim 30, Zhang discloses wherein the etching of the conducting layer forms gate electrodes having upper surfaces parallel to the substrate (Figure 4C).

Zhang does not disclose inclined side surfaces.

However, Noumi discloses also forming a thin film transistor (TFT) wherein the bus lines and connection portion have tapered or inclined sides to improved the coatability of the etched films (figure 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the bus lines and connection portions of Zhang with inclined or tapered sides because according to Naumi, the tapered or inclined sides of the bus lines and connection portion improve the coating of the etched films.

12. Claims 31 – 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. in view of Naumi.

In re claim 31, Zhang discloses forming a semiconductor layer having a predetermined shape on a substrate 21a and 21b; forming an insulating film on the substrate to cover the semiconductor layer 22; forming a conducting layer composed of an anodically oxidizable metal on the substrate in such shape as to cover a portion of

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the semiconductor layer and to form gate electrodes having an upper surface parallel to the substrate (figure 4A); anodically oxidizing the gate electrode (column 13); forming the insulating film into a predetermined shape using the gate electrodes including the anodically oxidized film as a mask (figure 4C); injecting impurities into the semiconductor layer using the gate electrodes including the anodically oxidized film and the insulating film as a mask to form an offset in the semiconductor layer (column 13).

Zhang does not teach wherein the bus lines and connection portions have inclined sides.

However, Noumi discloses also forming a thin film transistor (TFT) wherein the bus lines and connection portion have tapered or inclined sides to improved the coatability of the etched films (figure 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the bus lines and connection portions of Zhang with inclined or tapered sides because according to Naumi, the tapered or inclined sides of the bus lines and connection portion improve the coating of the etched films.

13. In re claim 32, Zhang teaches wherein the thin-film device is a substrate including thin-film transistor (figure 4C).

14. In re claim 33, Zhang teaches wherein the anodically oxidizable metal includes at least ^{one} of Al, Ta, Al-Si, Al-Ta, Al-Zr, Al-Nd, Al-Pd, Al-W, Al-Ti, Al-Ti-B, Al-Sc, Al-Y, Al-Pt and Al-Pa (column 13).

15. In re claim 34, Zhang teaches wherein the anodically oxidized film is a barrier-type anodically oxidized film (column 13).

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16. In re claim 35, Zhang teaches wherein the semiconductor layer includes polycrystalline silicone (column 12).

17. In re claim 36, Zhang teaches wherein an initial current density at the time of executing the anodic oxidation is not smaller than 2.0 mA/cm^2 but is not larger than 3.0 mA/cm^2 (column 13).

18. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang in view of Naumi as applied to claims 31 – 36 above, and further in view of Bae et al. (U. S. patent 5,202,274).

Zhang does not disclose wherein the etching is either ionic milling or dry-etching.

Naumi discloses forming tapered or inclined electrodes using a wet etch composition.

However, Zhang in view of Naumi does not teach wherein the etching is either ionic milling or dry-etching.

Bae discloses forming tapered or inclined electrodes using a dry etch composition (column 3).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the gate electrodes of Zhang by dry-etching as taught by Bae instead of wet etching since one of ordinary skill in the art will realize that dry etching and wet etching the gate electrodes for the disclose intended purposes are art recognized equivalents. Also, choosing a well-known etching technique on the basis of its suitability requires only ordinary skill in the art.

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19. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang and Naumi as applied to claims 31 – 35 above, and further in view of Wolf and Tauber (Silicon Processing for the VLSI Era Volume 1: Process Technology, pp 452 – 453).

Zhang in view of Naumi do not teach wherein a resist mask is post-baked at a temperature not lower than 130°C but not higher than 200°C, prior to forming the gate electrodes.

However, Wolf and Tauber in the textbook "Silicon Processing for the VLSI Era Volume 1: Process Technology", pp 452 – 453 discloses as conventional in the art to post bake a photoresist prior to etching the layers below at a temperature not lower than 130°C but not higher than 200°C.

Therefore, It would have been obvious to one having ordinary skill in the art at the time the invention was made to post-bake the photoresist of Zhang in view of Naumi prior to etching the gate electrodes to a temperature of 130°C but not higher than 200°C as taught by Wolf and Tauber as it is the conventional way to prepare a photo resist prior to etching the layers below it.

Response to Arguments

20. Applicant's arguments with respect to claims 1 – 6, 8, 9 and 22 – 30 have been considered but are moot in view of the new ground(s) of rejection.

21. Applicant's arguments with respect to claims 31 – 38 filed 3 February 2003 have been fully considered but they are not persuasive for the foregoing reasons.

22. Applicant contests that Noumi does not show motivation for the tapered or inclined sides for the conducting layer.

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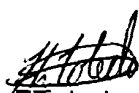
Examiner respectfully submits that Noumi does show proper motivation specifically column 4, lines 53 – 57. Noumi specifically discloses that "the coating relating to the film formed on the top surface can be improved by forming the etched end surface of the Al film in the tapered profile..." Hence the arguments of Applicant did not overcome the rejection.

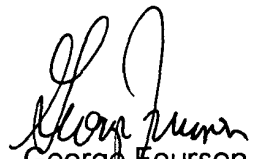
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is 703-305-0567. The examiner can normally be reached on Mon-Fri 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7382 for regular communications and 703-308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


F Toledo
April 15, 2003


George Fourson
Primary Examiner
Art Unit 2823